UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/825,484 | 04/14/2004 | Johannes Leendert Willem Cornelis Den Boestert | TS1382 (US) | 8133 |

23632 7590 06/27/2007

SHELL OIL COMPANY
P O BOX 2463
HOUSTON, TX 772522463

| EXAMINER | |
|---|---|
| BOYER, RANDY | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1764 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 06/27/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/825,484 | DEN BOESTERT ET AL. | |
| | Examiner | Art Unit | |
| | Randy Boyer | 1764 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *23 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. Examiner acknowledges response filed 23 April 2007 containing remarks.

2. The previous rejection of claims 1 and 2 under 35 U.S.C. 102(b) are maintained.

3. The previous rejection of claims 3-16 under 35 U.S.C. 103(a) are maintained.

4. New grounds for rejection of claims 1-16 under 35 U.S.C. 103(a) are entered. However, because the new grounds for rejection asserted by Examiner were not necessitated by Applicant's amendment of the claims, this Office Action is non-final. The rejections follow.

### *Claim Rejections - 35 USC § 102*

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Moller (WO 01/10540 A2).

7. With respect to claim 1, Moller discloses a process for separating contaminants from a mixture using a membrane having a feed side and a permeate side, by contacting the mixture with the feed side of the membrane, wherein between the feed

side and permeate side of the membrane a pressure difference is applied, thereby passing part of the mixture from the feed side to the permeate side and obtaining at the permeate side of the membrane a permeate having a reduced content of contaminants (page 1, lines 2-7), and by removing the permeate from the permeate side of the membrane, wherein during selected time intervals the removal of permeate from the permeate side of the membrane is stopped (page 6, lines 9-13) so that the pressure difference over the membrane is substantially lowered (page 4, lines 31-33, and page 5, lines 1-3).

8. With respect to claim 2, Moller discloses wherein the membrane comprises a top layer made of a dense membrane and a support layer made of a porous membrane (page 36, line 7).

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cederlof (WO 03/035803 A1) in view of Moller (WO 01/10540 A2). Alternatively, claims 3-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moller (WO 01/10540 A2) in view of Cederlof (WO 03/035803 A1).

13. With respect to claim 1, Cederlof discloses a process for separating color bodies and/or asphaltenic contaminants from a hydrocarbon mixture using a membrane having a feed side and a permeate side, by contacting the hydrocarbon mixture with the feed side of the membrane, wherein between the feed side and permeate side of the membrane a pressure difference is applied, thereby passing part of the hydrocarbon mixture from the feed side to the permeate side and obtaining at the permeate side of the membrane a hydrocarbon permeate having a reduced content of color bodies and/or asphaltenic contaminants, and by removing the hydrocarbon permeate from the

permeate side of the membrane, wherein during selected time intervals the pressure difference over the membrane is temporarily substantially lowered (see Cederlof, page 2, lines 4-13).

Cederlof does not disclose wherein the pressure difference over the membrane is temporarily substantially lowered by stopping the removal of hydrocarbon permeate from the permeate side of the membrane.

However, Moller discloses a membrane separation process for the removal of contaminants from fluid (see Moller, page 1, lines 2-7) during which, and at selected time intervals, the removal of permeate from the permeate side of the membrane is stopped (see Moller, page 6, lines 9-13) so that the pressure difference over the membrane is temporarily substantially lowered (see Moller, page 4, lines 31-33; and page 5, lines 1-3). Moller explains the principal advantage of such an operation to be that an efficient cleansing of the membrane can be achieved without the uncontrolled pressure oscillations and high backwashing pressures normally associated with other membrane separation control schemes, thereby reducing the risk of equipment failure and unacceptable vibrations over the membrane (see Moller, page 4, lines 16-20).

Therefore, the person having ordinary skill in the art of membrane separation of color bodies and asphaltenic contaminants from hydrocarbon mixtures would have been motivated to modify the membrane separation process of Cederlof to provide for a substantial lowering of the pressure difference over the membrane *by stopping the removal of hydrocarbon permeate from the permeate side of the membrane* (as taught by Moller) in order to effect an efficient removal of the color bodies and asphaltenic

contaminants from hydrocarbons while reducing the risk of equipment failure and unacceptable vibrations over the membrane.

Finally, the person having ordinary skill in the art of membrane separation of color bodies and asphaltenic contaminants from hydrocarbon mixtures would have had a reasonable expectation of success in modifying the process of Cederlof by incorporating the pressure control scheme of Moller because (1) both Cederlof and Moller are directed to the membrane separation of contaminants from fluids, and (2) the control scheme of Moller's membrane separation process is entirely compatible with Cederlof's membrane separation process to remove color bodies and asphaltenic contaminants from hydrocarbon mixtures.

14. With respect to claims 2 and 3, Cederlof discloses wherein the membrane comprises a top layer made of a dense membrane (e.g. poly(di-methyl siloxane)) and a support layer made of a porous membrane (see Cederlof, page 4, lines 4-31).

15. Additionally, with respect to claim 3, Moller discloses a process for separating contaminants from a mixture using a membrane having a feed side and a permeate side, by contacting the mixture with the feed side of the membrane, wherein between the feed side and permeate side of the membrane a pressure difference is applied, thereby passing part of the mixture from the feed side to the permeate side and obtaining at the permeate side of the membrane a permeate having a reduced content of contaminants (see Moller, page 1, lines 2-7), and by removing the permeate from the permeate side of the membrane, wherein during selected time intervals the removal of permeate from the permeate side of the membrane is stopped (see Moller, page 6, lines

9-13) so that the pressure difference over the membrane is substantially lowered (see Moller, page 4, lines 31-33, and page 5, lines 1-3); and wherein the membrane comprises a top layer made of a dense membrane and a support layer made of a porous membrane (see Moller, page 36, line 7).

Moller does not disclose wherein the dense membrane is made from a poly-siloxane.

However, Cederlof discloses a continuous process to separate color bodies and asphaltenic contaminants from a hydrocarbon mixture by passing part of the mixture through a polysiloxane membrane (see Cederlof, page 1, lines 1-7, and page 4, lines 24-26). Cederlof explains that polysiloxane membranes are highly effective at removing contaminants and color bodies from a hydrocarbon mixture due to the membrane's ability to block the diffusion through of the high molecular weight and structurally complex contaminant particles (see Cederlof, page 4, lines 21-24).

Therefore, the person having ordinary skill in the art of membrane separation would have been motivated to substitute a polysiloxane membrane (such as that used by Cederlof) in the separation process disclosed by Moller in order to provide an effective means of removing color bodies and asphaltenic contaminants from a hydrocarbon mixture.

Finally, the person having ordinary skill in the art of membrane separation would have had a reasonable expectation of success in modifying the process of Moller so as to incorporate the polysiloxane membrane of Cederlof because (1) both Moller and Cederlof are directed to the membrane separation of contaminants from fluids, and (2)

the process and apparatus of Moller is entirely compatible for use in removing color bodies and/or asphaltenic contaminants within the scope of Cederlof's process.

16. With respect to claim 4, Moller discloses wherein the pressure difference is lowered by at least 20% (see Moller, Figure 9).

17. With respect to claim 5, Cederlof discloses wherein the pressure difference across the membrane during separation is between 10 and 30 bar (see Cederlof, page 5, lines 21-23).

18. With respect to claim 6, Cederlof discloses wherein the pressure difference is lowered to 0 bar (see Cederlof, page 5, lines 23-26).

19. With respect to claim 7, Cederlof discloses wherein time periods of between 5 and 480 minutes of continuous separation across the membrane alternate with time intervals of between 1 and 60 minutes at which the pressure difference is substantially lowered (see Cederlof, page 6, lines 28-35, and page 7, lines 1-5).

20. With respect to claim 8, Cederlof discloses wherein the time interval at which the pressure difference is substantially lowered is below thirty minutes (see Cederlof, page 6, lines 34-35, and page 7, lines 1-5).

21. With respect to claim 9, Moller discloses wherein the removal of permeate from the permeate side is stopped at regular intervals (see Moller, page 8, lines 22-26).

22. With respect to claim 10, Moller discloses wherein the permeate is removed from the permeate side of the membrane through a conduit including a permeate valve, which valve is closed during the selected time intervals so as to stop the removal of permeate (see Moller, page 6, lines 9-13, and Figure 1).

23. With respect to claims 11 and 12, Cederlof discloses wherein the membrane is operated at a temperature between 10°C and 100°C (see Cederlof, page 7, lines 6-8).

24. With respect to claim 13, Cederlof discloses wherein the hydrocarbon mixture has an initial boiling point greater than 20°C and 95% recovery point of less than 600°C, determined by ASTM D2887 (see Cederlof, page 3, lines 14-20).

25. With respect to claim 14, Cederlof discloses wherein the hydrocarbon mixture has an ASTM D1500 color index of above 2 (see Cederlof, page 2, lines 34-35, and page 3, lines 1-2).

26. With respect to claim 15, Cederlof discloses wherein the hydrocarbon mixture is a contaminated natural gas condensate or a contaminated refinery stream (see Cederlof, page 3, lines 20-23).

27. With respect to claim 16, Cederlof discloses wherein the hydrocarbon mixture is a liquid hydrocarbon feed from which light olefins are to be produced by thermal cracking, wherein the membrane forms part of a membrane separation unit in which the hydrocarbon permeate is removed from the permeate side of the membrane, and wherein a retentate is removed from the retentate side of the membrane, and wherein the process further comprises the steps of: (a) supplying the permeate to the inlet of a cracking furnace, allowing the permeate to crack in the coils of the cracking furnace in the presence of steam at elevated temperature and removing from the cracking furnace a cracked stream which is enriched in light olefins; (b) quenching the cracked stream; (c) supplying the cooled cracked stream to a fractionation column; (d) removing the retentate; and (e) removing from the top of the fractionation column a gaseous stream,

from the side of the fractionation column a side stream of fuel oil components and from the bottom of the fractionation column a bottom stream (see Cederlof, page 12, lines 21-35, and page 13, lines 1-9).

***Response to Arguments***

28. Applicant's arguments filed 23 April 2007 have been fully considered but they are not persuasive.

29. Examiner understands Applicant's principal argument to be:

> Moller does not teach or suggest the desirability of stopping the removal of the permeate during selected time intervals, so that the forward pressure differential from the retentate to the permeate is temporarily substantially lowered.

30. Moller discloses at page 6, lines 9-14:

> *The preferred embodiment of the method according to the invention comprises the further steps of providing a flow resistance means such as a valve and* ***adapted for periodically reducing or stopping the flow of permeate through said permeate outlet, and activating said flow resistance means during said backwashing phase such that the flow of permeate through said permeate outlet is reduced or stopped.*** *Hereby it is avoided that the backwash permeate flow is diverted from the desired transmembrane flow path thereof* (emphasis added).

Furthermore, Moller discloses at page 4, lines 31-33, and page 5, lines 1-3:

> *The configuration of the membrane and the flow paths of the permeate and the retentate* ***during backwashing*** *give rise to pressure losses in both the permeate and the retentate, and therefore* ***it is advantageous that the flow of permeate relative to the permeate facing surface of the membrane be facilitated such that said flow of permeate is such that is corresponds to the flow of retentate and the pressure of the permeate and the retentate***

***correspond to each other to the highest degree possible*** (emphasis added).

Therefore, if the pressure of the permeate and the retentate are to "correspond to each other to the highest degree possible" (i.e. they are to be substantially the same), it follows that the pressure differential from the retentate to the permeate is substantially lowered (i.e. $\Delta P$ across the membrane will be at or near zero).

Thus, it is clear from the foregoing passages that Moller does in fact explicitly teach stopping the removal of the permeate during selected time intervals, so that the forward pressure differential from the retentate to the permeate is temporarily substantially lowered.

Finally, Examiner notes that Moller also explains the advantage (or desirability) of operating a membrane separation process under such a control scheme to be that an efficient cleansing of the membrane can be achieved without the uncontrolled pressure oscillations and high backwashing pressures normally associated with other membrane separation control schemes, thereby reducing the risk of equipment failure and unacceptable vibrations over the membrane (see Moller, page 4, lines 16-20).

## *Conclusion*

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 8:00 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RPB

Glenn Caldarola
Supervisory Patent Examiner
Technology Center 1700